East Engin.
Library
TS
670
.A1
A51

The MONTHLY REVIEW

Published by the

American Electro-Platers' Society

A SOCIETY FOR THE ADVANCEMENT OF THE SCIENCE OF ELECTRO-PLATING

Zn & Cd thickness

Entered as second class matter at the Post Office at Springfield, Mass., September 8, 1930, under Act of August 24, 1912.

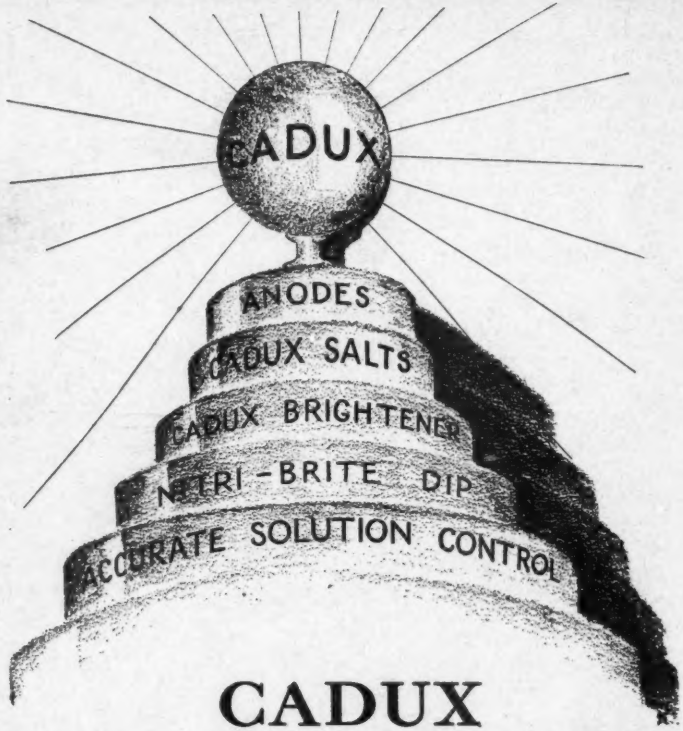
Acceptance for mailing at special rate of postage, provided for in section 1103, Act of February 28, 1925, authorized September 3, 1926.

MARCH . . . 1935

IN THIS ISSUE

Editorial — Shall We Continue to Give the Assistant Foreman the Cold Shoulder? 5
Exhibitors — Bridgeport Convention .. 7
Meeting of the Joint-Committee on Specifications 8
Hall and Strausser — Dropping Tests for Determining the Local Thickness of Electro-deposited Zinc and Cadmium Coatings 9
Mitchell — Recent Developments in Metal Cleaning 15
Cosgrove — Suspended Matter in Plating Solutions 27
Schulein — The Electrolytic Treatment of Zinc 30
The Abstract Section 35
Principles of Chemistry 43
"How It Is Done" 45
Branch News 51
Membership Report 59
Membership Drive Barometer 60
Buyers' Guide 62
Branch Directory 64

Subscription - - $3.00 a year



CADUX
IS ON A FIRM FOUNDATION

YOU cannot compare Cadux plating with ordinary cadmium. For lustre, density, and color, it has no equal.

Cadux materials plus Cadux control methods keep your production up to 100% quality all of the time.

Cadux materials with Cadux brightener produce the typical silver bright Cadux finish. For even higher lustre and prevention of tarnishing the nitri-brite dip will be a revelation to you. This method is replacing other finishes in hundreds of applications. Let us plate a sample of your product as a demonstration.

HANSON-VAN WINKLE-MUNNING

HANSON-VAN WINKLE-MUNNING COMPANY, MATAWAN, N.J.

639

The Monthly Review

Published by the
AMERICAN ELECTRO-PLATERS' SOCIETY

Publication and Editorial Office
90 Maynard St.
Springfield, Massachusetts

VOL. XXII MARCH 1935 NO. 3

Shall We Continue to Give the Assistant Foreman *the Cold Shoulder?*

[*Editorial*]

At the Detroit convention last year the question of admitting assistant foremen platers into our organization was one of the topics freely discussed. At that time Mr. George Gehling made a motion as follows: "That a committee be appointed to investigate the conditions and make a recommendation within the next five or six months, and then report to the Executive Board. Let them have it put to a referendum vote before we come to the next convention." This motion was seconded and carried.

On November 30th, 1934, Mr. Gilbertson, Supreme President, instructed the Secretary, Mr. E. Steen Thompson to mail letters to the Branch Presidents, quoting the convention resolution and stating "this committee was appointed some time ago and you are a member of same. Kindly talk over this membership matter with the members of your Branch to find out what they desire and make such suggestions as you see fit by January 15, 1935." We have tried on several occasions to receive some information regarding the action of the branches but so far have been unsuccessful.

Must we come to this year's meeting in Bridgeport without anything tangible to work upon? Is the assistant foreman to knock at the door of the Convention year after year asking for admission, only to be refused time and time again? Will the 1935 Convention cater to a few individuals in one or two branches who have always been instrumental in blocking the wheels of progress in our organization, or will we rise in our might and demand that the will of the majority shall prevail?

We believe it would be an evening profitably spent if our membership would read the minutes of the Detroit Convention pages 68 to 77 at their next Branch meeting regarding the discussion on this matter and immediately write Mr. Thompson, our Supreme Secretary, 905 W. 10th St., Erie, Penna., so that we can come prepared to take definite action at the Bridgeport Convention. Within these pages you will find out how the more prominent members of our organization feel regarding the assistant foremen and their relationship to the A. E. S. Ask yourself also if there is any good reason why your assistant should not have the same advantages in belonging to an educational society like ours as you do. Figure it out if you can, why it is that we invite assistant foremen to the social events of our societies, we give him an invitation to attend our Branch meetings when we have an outstanding speaker, and would like to swell our attendance. Yea, verily we get so reckless on occasions that we bring him to our chemistry classes. But he can't become a member of our organization. WHY?

The membership campaign has not been a success so far. Several branches have done splendidly but there has been little or no enthusiasm displayed by most of the branches whose numbers were depleted by the unsettled conditions in industry during the last few years. In the hope that we decide to invite the assistant foremen to join our organization, it might be well to give them the privilege of active membership because if there is anything we need it is new blood to stimulate us and put life into our various branches.

We can name at least ten branches whose officers have not interest enough in their Society to send the Editor a report of the activities of their Branch for publication in the REVIEW during the past year. These are the leaders to whom has been entrusted the successful carrying out of our membership campaign and failed because they are not interested enough in the organization they represent.

We may be criticized for "taking off the kid gloves" but we are jealous of other organizations whose members are wide awake and active. They never miss a meeting and are constantly approaching prospective members lauding their particular society, and leaving no stone unturned until they land their man. This is our aim. If we of another generation have failed

to keep abreast of the times; if we think we have borne the burden and heat of the day long enough, let us gracefully step down and make way for those whose vision is clearer than ours and whose ideals are higher.

We need leadership, our branches have suffered for want of it. There is leadership lying dormant amongst our assistant foremen, let's give them a chance. We turn our job over to them when we attend the conventions and take our vacations. If we have confidence enough in them thus far, why not give them the full benefits of an educational Society such as ours? The investment will be a profitable one to all parties concerned.

Let us break down the old barriers that have kept us in bonds so long, we want to place ourselves on an equal footing with organizations similar to our own. If your Branch has not taken action, do it at once. Branch Presidents, be sure to bring this matter up at your next meeeting.

Exhibitors

A. E. S. Bridgeport Convention

Following is the list of firms who have contracted for space in the American Electro-Platers' Exhibition to be held in connection with the National Convention in June of this year:

Apothecaries Hall Co.
G. S. Blakeslee & Co.
Chandeysson Electric Co.
Contract Plating Co.
Egyptian Lacquer Mfg. Co.
J. B. Ford Co.
Grasselli Chemical Co.
Hanson-Van Winkle-Munning
Lasalco, Inc.
Lea Mfg. Co.
Maas & Waldstein Co.
MacDermid, Inc.
Matchless Metal Polish Co.
Norton Company
Pyrene Mfg. Co.
N. Ransohoff, Inc.
Rex Products & Mfg. Co.
Seymour Mfg. Co.
F. B. Stevens, Inc.
Tuttle Chemical Corp.
Udylite Company
Zapon Company

At the rate contracts are being received and the interest which is shown by additional potential exhibitors, all available space will soon be allotted.

A **Meeting** *of the Joint Committee on Specifications*

DURING the A. S. T. M. Conferences in Philadelphia, a meeting of the Joint Committee on Specifications for Plating on Steel will be held at the Hotel Warwick, 17th and Locust Streets, at 10 A. M. on Monday, March 4th, to which members of the committee and other interested persons are invited. At that time a few proposed changes in the draft of specifications dated February 2d will be considered, in order that these specifications may be put into shape to submit to Sub-Committee VI of A-5 at their meeting at 3 P. M. on Tuesday, March 5th.

At 2 P. M. on Monday, March 4th, a meeting of the joint committee on the new exposure tests will be held to discuss the plans and progress of this program.

Other committee meetings that week that may be of interest to those engaged in electroplating are as follows:

March 4, Monday, 4 P. M. - Sub-Committee VII of A-5, on methods of testing electroplated coatings. W. M. Phillips, Chairman.

March 5, Tuesday, 10 A. M. - Committee B-3 on Corrosion of non-ferrous metals and alloys. T. S. Fuller, Chairman.

March 5, Tuesday, 8 P. M. - Sub-Committee VIII of A-5, on Field tests of metallic coatings. R. F. Passano, Chairman.

March 6, Wednesday, 3 P. M. - Committee A-5 on Corrosion of iron and steel. F. F. Farnsworth, Chairman.

In order that there may be a good representation of persons interested in plating, this notice and invitation is being sent not only to the Joint Committees of the A.S.T.M. and A.E.S., but also to the Officers and Research Committee of the American Electro-Platers' Society.

Dropping Tests

for Determining the Local Thickness of Electro deposited Zinc and Cadmium Coatings

By R. O. HULL[1] and P. W. C. STRAUSSER[2]

IN recent specifications for the quality of electroplated coatings, greater emphasis has been laid upon the minimum than upon the average thickness of the deposits. This criterion is especially justified in connection with electroplated coatings of zinc and cadmium, the protective value of which depends principally upon their thickness. Rapid reliable methods for measuring the local thickness of such coatings are essential to the application of specifications for minimum thickness.

The purpose of this paper is to describe methods for measuring the local thickness of cadmium and zinc coatings on steel. It is hoped that these methods will be given a thorough trial, so that, if satisfactory, they may be incorporated in specifications that are now under consideration.

PRINCIPLE OF THE METHODS

The proposed methods depend upon the rate of solution of the coating by a suitable reagent. Much the same principle is involved in the Preece test for zinc coatings, which involves immersion in a copper sulphate solution until adherent copper is deposited where the zinc coating is thinnest. Experience with the Preece test and with other immersion tests (including those using ammonium nitrate solutions) has shown that while they are valuable for detecting lack of uniformity of thickness, the time required to produce the endpoint is not always an accurate measure of the minimum thickness.

More consistent results are obtained with methods in which fresh reagent is continuously supplied to the surface. A "dropping method" for cadmium was described by S. G. Clark[3], who allowed an aqueous iodine solution (100 g/l of iodine and 200 g/l of potassium iodide) to drop at a specified rate (one drop

per second) upon the surface to be tested, until the steel was exposed. He found that under these conditions, 18 drops were required for each 0.0001 inch of cadmium. Experiments by one of the authors (P. W. C. Strausser) have confirmed this rate for cadmium coatings, and have shown that with the same solution and conditions, 22 drops are required for each 0.0001 inch of zinc coating. Possible objections to this method are the relatively high cost of the iodine solution if many tests are performed, the irritating odor of the iodine fumes from the vessel into which the solution runs, and the etching of the steel by the iodine solution.

As ammonium nitrate solutions have been frequently used for the total stripping of cadmium coatings, their application to dropping methods was tried by R. O. Hull and found to yield satisfactory results. The method was confirmed by P. W. C. Strausser, who also applied it to zinc coatings.

It was found that the rate of dropping of acidified ammonium nitrate solutions does not have much effect upon the results, especially if a fairly rapid rate, such as 80 to 120 drops per minute, is used. The results are therefore expressed in terms of the time instead of the number of drops required to dissolve a given thickness of coating. For convenience the concentration of each reagent was adjusted empirically by tests with coatings of known thickness, so that each 0.00001 inch of coating requires 1 second. No accurate control of temperature is required. A change from 25 to 35°C (77 to 95°F) increased the rate (that is reduced the time) about 10 percent.

The dropping methods are especially convenient for testing any part of a large article, the complete stripping of which would be impracticable. On small articles these methods consume less reagents than would be needed for complete stripping by immersion.

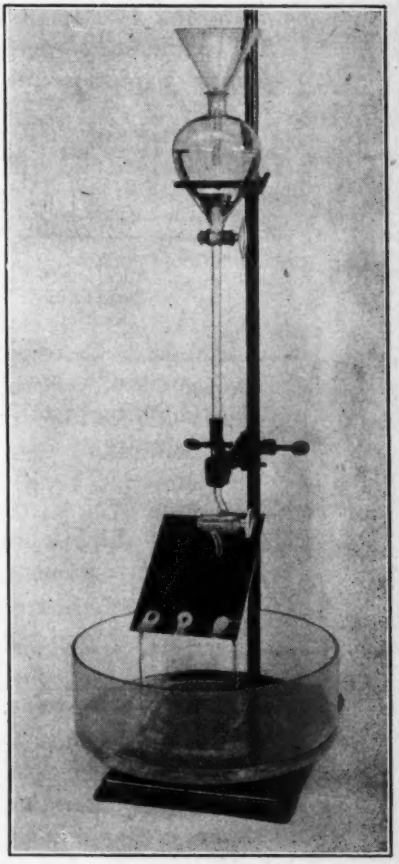
The latter method may be used, with the same reagents, to determine the approximate distribution of the coatings on small articles. If the latter are moved rapidly in the solution, the initial time required for exposing the base metal corresponds

---

[1] Experimental Laboratory, Grasselli Chemical Co., Cleveland, Ohio.
[2] Research Associate of the American Electro-Platers' Society at the National Bureau of Standards.
[3] J. Electrodepositors' Tech. Soc. 8, No. 11, May, 1933.

roughly with that required for the same thickness by the dropping method, but the results are not so consistent.

METHOD OF OPERATION



The apparatus, such as that shown opposite, can be readily made from the usual laboratory equipment. A 250-ml separatory funnel is connected by rubber tubing to a straight two-way stopcock, the lower end of which is drawn down to a tip with an orifice similar to that on the average burette. A glass or porcelain dish is placed under the tip, and the specimen is so supported that the drops of liquid strike the point to be tested and run off quickly without touching areas to be subsequently tested. A longer rubber tube than that shown is an advantage when testing articles of irregular shape, as then the drops can be directed. If feasible, the surface tested should be inclined at least 45° from horizontal.

The surface of the specimen should be cleaned so that it is free from "waterbreak", for example by treatment with an organic solvent, followed by light rubbing with a magnesium oxide suspension. The surface should be dry at the beginning of the test.

Before a test, the stopcock of the separatory funnel is opened wide and the solution is allowed to fill the lower tube. The lower cock is then adjusted so that 100 ± 20 drops fall per minute. The upper cock is closed, the specimen put in place, and the upper cock again opened. The period required from the time the first drop touches the plate until bare steel is exposed is measured with a stopwatch. The upper cock is then closed. If the articles are to be replated, they should be quickly rinsed, especially after testing zinc coatings with the more acid solution.

RECOMMENDED CONDITIONS

1. For Cadmium Coatings—After numerous preliminary experiments, a solution containing 110 g/l of C. P. ammonium nitrate and 10 ml/l of concentrated hydrochloric acid (sp. gr. 1.18, containing 36 percent of HCl) was selected for cadmium coatings. Typical results with it are shown in

TABLE 1

Dropping Tests on Cadmium Deposits. Solution Containing 110 g/l of NH_4NO_3 and 10 ml/l of conc. HCl
Dropping rate = 80 to 120 drops/min. Room temperature

Expt. No.	Addition to Depositing Solution	Average Thickness From Weight In.	Average Time Seconds	Error[1] Percent
1	sulphite waste	0.00024	24	0
2	sulphite waste	.00047	51	+ 9
3	sulphite waste	.00044	51	+16
4	none	.00051	43	−16
5	none	.00049	43	−12
6	Ni + sulphite waste	.00045	47	+ 4
7	sulphite waste	.00094	108	+15
8	sulphite waste	.00101	106	+ 5
			Av.	+ 3

[1]Calculated on the basis of one second for each one-hundred thousandth inch.

Part of the specimens used in these tests (and also those with zinc coatings) were selected from the weighed specimens produced in the preparation of samples for the exposure tests, and part were prepared in small jars, with precautions to obtain uniform distribution of the coatings. The average thickness of each coating was computed from the weight of the deposit. In some cases these values were confirmed by completely stripping the specimens after the dropping tests were completed, and reweighing the base metal.

Each period reported in Table 1 is the average of nine tests on each side of the specimens. The errors have been computed on the basis of one second for each 0.00001 inch of deposit. The data show that the average results for the three types of cadmium deposit are close to the true values. Bright deposits, produced in

solutions containing organic addition agents, require somewhat longer to dissolve than the dull deposits from plain solutions. Most commercial cadmium plating is produced from solutions containing brighteners. The use of the above solution and factor therefore allows a tolerance of approximately 10 percent in the testing of bright deposits, which is about the limit of accuracy of the method.

2. For Zinc Coatings—It was found that plain zinc deposits were dissolved approximately at the rate of one second for 0.00001 inch by a solution containing 100 g/l of ammonium nitrate and 55 ml/l of concentrated hydrochloric acid. If, however, the zinc was deposited from cyanide solutions containing a small amount of mercury, the results with the hydrochloric acid solution were indefinite and inconsistent.

It was then found that by substituting nitric acid for hydrochloric acid, the solution dissolves all types of plated zinc coatings (but not hot-dipped coatings) at about the same rate, although the endpoint is somewhat less distinct with deposits containing mercury. The solution finally adopted contains 100 g/l of ammonium nitrate and 55 ml/l of concentrated nitric acid (sp. gr. 1.42, containing 70% of HNO_3). Typical results with this solution are shown in Table 2. These results show that the method is applicable with an accuracy of about +10 percent to zinc deposits from both acid and cyanide solutions, including those containing mercury.

TABLE 2

Dropping Tests on Zinc Deposits. Solution Containing 100 g/l of NH_4NO_3 and 55 ml/l of conc. HNO_3.
Dropping rate = 80 to 120 drops/min. Room temperature

Expt. No.	Depositing Solution	Average Thickness From Weight In.	Average Time Seconds	Error Percent
1	cyanide	0.00026	26	0
2	cyanide	.00047	42	−11
3	cyanide	.00097	101	+ 4
4	cyanide + Hg	.00047	43	− 9
5	sulphate + dextrin	.00051	53	+ 4
			Av.	− 2

[1]Calculated on the basis of one second for each one-hundred thousandth inch.

CONCLUSIONS

With appropriately selected solutions that have been standardized against deposits of known thickness, dropping methods may be used to determine the local thickness of zinc and cadmium deposits. These methods will probably prove useful for measuring the minimum thickness and the distribution of the deposits, especially on large articles.

L. K. Lindahl

At their annual meeting, the directors of The Udylite Company, Detroit, Michigan, elected L. K. Lindahl vice president and general manager of the Company.

Mr. Lindahl's appointment comes after twelve years of association with The Udylite Company. In 1923, shortly after leaving the University of Illinois, he joined the sales engineering staff in Kokomo, Indiana, the headquarters of the Company at that time. In recognition of his sales and executive ability, Mr. Lindahl was promoted to the position of sales manager in 1929, the Company having since moved its general offices and laboratories to Detroit.

As Sales Manager, Mr. Lindahl's duties broadened with the activities of the Company until, in addition to outlining sales policy, they included technical supervision and product development.

Since 1929, The Udylite Company has enjoyed rapid growth under Mr. Lindahl's management. The Company has twice moved to larger quarters to provide the necessary room for expansion. Not only has he served Udylite faithfully and well, but also the plating industry as a whole. Many important electroplating developments are the result of his ingenuity and far-sighted judgment.

Mr. Lindahl is a member of Sigma Chi Fraternity, Rotary Club and is active in Detroit civic affairs.

Recent Developments in Metal Cleaning

By R. W. MITCHELL

Read at Detroit Convention 1934

IN an article published some years ago, the writer called to the attention of those interested in metal cleaning, the value of studying and applying data and methods which have developed in the textile field. This merits even greater notice today, as important new developments are rapidly being introduced which are improving and displacing older methods.

The textile industry is the largest consumer of soaps and cleaning materials. Cleansing and related processes constitute a large part of textile manufacturing costs, and hence have been the subject of a great deal of technical study. Most of our knowledge of soaps and other cleansing agents has come from research of textile origin. Even solvent degreasing, relatively new in metal cleaning, is an old story in the textile field. Raw wool has been degreased with solvents for many decades in certain mills.

Recent progress in this field has been rapid and very extensive. Many new materials and methods unheard of not many years ago have already gained widespread adoption. Synthetic soaps, or soap substitutes, solvent soaps, wetting agents, penetrating agents, synthetic solvents hitherto absolutely unknown, and newly developed techniques of use are making significant changes in detergent processes.

An exact understanding of the mechanism of detergent processes and of the way in which different cleaning materials act, has never been arrived at in spite of a large amount of research done upon the problem. There are, however, certain factors which are recognized, and concerning them we have data, and with this data we can to some extent predict and control performance.

In washing there are several successive steps:

1. Wetting of the surface.
2. Penetration of the dirt layer.
3. Breaking up of the dirt layer — emulsification and deflocculation.

4. Suspension of the dirt in the cleaning solution.
5. Completion of its removal, and also removal of cleaner absorbed by the metal surface, by rinses.

WETTING

The surface to be cleaned must first be wet. The solution must have what is called "wetting power."

The dirt upon the surface must be affected by the cleaning solution which has wet it. The cleaning solution must have penetrating and what has been so often called "colloidal" properties. That is, there must be in the solution material which will act at and upon the boundary between dirt and solution. This boundary is called the "interface." It is important in cleaning discussion.

An understanding of surface tension and interfacial tension is most valuable in gaining an insight to detergent processes. There is considerable misconception and misuse of the term "surface tension." Strictly, surface tension is a property of a liquid/air boundary. Tension at a liquid/liquid or liquid/solid boundary or interface is properly termed interfacial tension.

SURFACE TENSION

Liquids possess, at their free surfaces, a sort of "skin" — a layer having properties different from the rest of the liquid.

Because of attractive forces of their interior molecules, all liquids behave as if their free surfaces were stretched skins, that is, as if their free surfaces were under tension.

In Mr. Phillip's projections last night, showing the surface of a nickel solution undergoing electrolysis, the way the rising hydrogen bubbles were spread out by and trapped under the surface was an indication of this surface skin.

A drop of liquid tends to assume a spherical shape on account of its surface tension. The tension of the surface tends to pull the surface into the smallest possible area. A given volume exposes the smallest surface when in the form of a sphere, hence the tendency to pull up into drops.

Surface tension can probably best be explained by means of a few simple experiments. The floating of a needle upon water is familiar to all. The surface film can be seen depressed by the weight of the needle, but it does not break. A drop of kerosene

spreads out in an ever widening layer on a clean water surface because the tension of the clean water surface beyond the layer of oil is greater than the tension of the oily surface. The oil film is thus stretched out to its limit. A thin layer of oil on a heated sheet of metal pulls away from the hotter part and piles up on the cooler area. This is because its surface tension is decreased by heat. The pull of the cooler parts of the film are greater than of the heated part: hence it is pulled aside to the cooler area.

If a plate is wet with a film of water, and one edge of this film is touched with a drop of alcohol, the water film will be seen to quickly pull away from this spot, leaving it dry. The solution of alcohol in water lowers its surface tension. Hence, the contaminated spot is pulled away by the greater tension of other parts of the film.

Interfacial tension is the physical force which keeps oil and water from mixing and which determines the nature of the boundary between them when they are brought together.

Decrease of this interfacial tension between oil and water must be the prelude to cleaning.

Detergent action and interfacial tension are both largely determined by the same factors. And it might appear that interfacial tension could be a measure of detergent action.

The result of many researches seeking to establish this point show that although there is a parallelism between the two, one is not always a direct measure of the other. Yet those substances which produce large decreases of interfacial tension when dissolved in water are usually most efficient detergents.

Soap is one of the best materials for lowering interfacial tensions. There are, however, limitations to its use, such as formation of insoluble compounds with all metallic ions, decomposition by acid solutions, "salting out" by strongly alkaline solutions. Soap substitutes free from some or all of the drawbacks of ordinary soap have been synthesized and are becoming well known. They, in turn, have their own drawbacks, the chief of which, as far as widespread adoption is concerned, is extremely high price.

For many years soaps of sulfonated oils have been used as wetting agents, where the above limitations of ordinary soaps precluded their use. Sulfonation, however, robs the soap of another valuable property — that of deflocculating and suspending

dirt. Moreover, at higher temperature much above 60°, the wetting power decreases rapidly.

$CH_3 (CH_2)_7 C^H = C^H - (CH_2)_7 - COOH + H_2SO_4$

$CH_3 (CH_2)_7 C^H_H - C^H_{HSO_4} - (CH_2)_7 - COOH$

and $CH_3 (CH_2)_7 C^H_H - C^H_{OH} - (CH_2)_7 - COOH + H_2SO_4$

$CH_3 (CH_2)_7 CH_2 - C^H_{OSO_4H} - (CH_2)_7 - COOH$

(Formation of Sulfonated Oils)

It has been found that by catalytic reduction with hydrogen gas under high pressure, fatty acids are converted into fatty alcohols. The sulfates of these alcohols have soap-like tension lowering and detergent properties, and are stable in acid or alkaline or salt solutions within certain limits.

$$CH_3 - (CH_2)_7 - C^H = C^H - (CH_2)_7 - COOH + 2H_2 \longrightarrow$$

$$CH_3 - (CH_2)_7 - C^H = C^H - (CH_2)_7 - C^{H^2} + OH + H_2O + H_2SO_4 \longrightarrow$$

$$CH_3 - (CH_2)_7 - C^H = C^H - (CH_2)_7 - CH_2OSO_3H$$

(Formation of Fatty Sulfates)

Another similar material is produced by causing isethionic acid to react with oleic acid chloride. A more stable form is made by first forming the amide from oleyl chloride and then condensing, giving the product known as Igepon T.

$$CH_3 - (CH_2)_7 - CH = CH(CH_2)_7 - CON^{CH3} CH_2CH_2SO_3Na$$

In both these types it may be noted that the objective of the reactions has been to form a new molecule with the same long chain structure and with a terminal acidic radical. The exchange of the carboxyl radical for the sulfonic radical gives a product whose salts are more soluble, hydrolyze much less, and are not decomposed by acid solutions.

These types are still much like soap in their structure, and are made from the same raw materials as soap. An entirely different type has also been highly developed. This type is made by sulfonating naphthalene or some similar coal tar product, and coupling with alcohol radicals. A typical one is 1-6 di-isobutyl naphthalene sulfonate. The product foams and wets like soap, but does not have its detergent properties.

There has been, and is yet going on, a tremendous elaboration of the types of synthesis indicated on the previous page. I have

been making a study of these, and have already listed over 100 different kinds of reactions and products claimed in patents. Some of these have already found a place in industry, and it is apparent that, from the great amount of investigation which is being directed upon this field, some changes in materials and methods for washing are probable.

A method employed for measuring and comparing these wetting agents may be of interest. One commonly used is described by Draves and Clarkson, in the American Dyestuff Reporter of March, 1931.

Another method is described by Lenher and Smith, industrial and Eng. Chem., Analytical Edition, 5, 6, 1933.

Some figures by the former method may be of interest.

At 60° C. wetting times with different materials at the same concentration by weight are compared.

Material	Seconds
Dibutylated Naphthalene Sulfonate	2
Oleyl alcohol sulfate	6
Sulfonated Castor Oil	35
Double sulfonated castor oil	29
Sulfonated olive oil	33
Double sulfonated olive oil	28

Figures are given by Lenher and Smith (as above) for olive oil soap, dialkylated naphthalene sulfonate (A), sodium lauryl sulfate (B), sodium oleyl sulfate (C), and the condensation product of oleyl acid chloride with taurine (D).

Surface tensions of solutions (25°C)

% Conc.	Soap	A	B	C	D
.0	72	72	72	72	72
.1	26.7	44.8	27.9	34.5	32.0
.5	27.3	34.1	28.9	32.8	31.4
.1	—	32.6	—	34.0	31.1

Wetting times in seconds:

0.1	—	—	35	31.5	—
0.2	33.8	32.9	15.8	9.3	41.7
0.4	7.1	7.4	7.9	5.0	28.4

These figures give some idea of the comparison between these new materials and soap.

In addition to the new synthetic wetting agents, some of the new solvents have properties which allow the compounding of solvent soaps, which not only have pronounced solvent action, but also good wetting effect.

Some solvents have a unique property, which for want of a better term is called soluble-izing or blending ability. Oil and water solutions will not mix. Yet, when some of these solvents carried in a soap are added to the aqueous solution, it can hold a considerable amount of oil in apparent solution.

This phenomenon goes by the name of hydrotropy.

There is some question as to whether the oil is not merely so finely emulsified that the solution has the clarity and appearance of true solution. At any rate, the result of such blending is to make soap solutions very much more effective for removing oily dirt.

A recent article on wetting (Chem. and Ind. 49-96 T, 1930) gives some interesting figures on interfacial tensions which might be useful to one working with such solvent soaps. These figures were obtained by the use of a stalagmometer or dropping pipette.

Typical figures are:

	S. T. of liquid saturated with H_2O	S. T. H_2O Saturated with Liquid	Interfacial Tension
Benzene	28.8	63.2	34.4
Ether	17.5	28.1	10.6
Aniline	42.2	46.4	4.8
Carbon Tetrachloride	70.8	43.5	43.8
Cresylic Acid	34.3	37.8	3.9
Kerosene	22.0	69.6	46.4
Paraffin Oil	24.7	73.0	48.7
Turpentine	27.2	63.0	34.2
Alpha Terpineol	—	—	10.4
Pine Oil	30.0	—	11.4

In attempting to clean heavy oil or grease by emulsions of light petroleum or coal tar solvents of high solvent power, little is gained as the emulsified solvents are held in emulsion and do not have opportunity to wet, penetrate and soften the dirt. When put into solution, instead of emulsion, however, their action is very effective.

Solvent soaps have long been important in the textile field. I believe they will become important in the metal cleaning field,

on such jobs as removal of carbon black, and buffing and coloring compounds.

At an A.E.S. meeting in Washington, about 1926, I took part in a round-table discussion on metal cleaning. Two questions were propounded concerning two of the always difficult metal cleaning jobs: the first was "how to quickly remove a straight mineral oil film which resists emulsification by the usual aqueous alkaline-soapy cleaning solution." The answer to this was, to first dip the work in some petroleum solvent in which had been dissolved a small percentage of oleic or similar fatty acid. This pre-treatment would make the resistant oil film on the work much more readily and quickly emulsifiable in the subsequent cleaning. The second question was, "how to remove solid-particle-dirt or smut left behind on a metal surface by a cleaning process which removes alone the oily dirt." This has always been one of the most difficult problems. Wiping or brushing, tumbling and in some cases, high pressure rinsing, or "hydraulic scrubbing," will suffice to remove it. This is often a case where both particle and metal are wet and only oiling together or cohere by capillarity.

Wetting is important when its action upon two dissimilar bodies is concerned. Consider solid dirt particles of one material upon a surface of another material.

Quite often there is another case where one solid may be wetted by one of two liquids which are present. A typical case would be a carbon particle or metal filing on a surface wetted with oil and exposed to a soap solution. It is known that there are some cases where the solid-particle-dirt emulsifies with the oil and washes away. In others (notably black smut on steel) the oil washes away and leaves the smut fast upon the surface.

If carbon black is added to water and paraffin oil and shaken thoroughly, the carbon black will be found to have all left the water phase and to have gone partly into the paraffin oil and partly into the interface. If carbon tetrachloride or benzene is substituted for the paraffin oil, the carbon black will be found in them entirely, after shaking. Chalk shaken with water and oil goes into the interface. Calcium phosphate is found in both the interface and the water phase. Calcium silicate stays in the water phase.

The difficulties of this field can be seen in the work of Briggs, who showed that certain finely divided solids, when together, had antagonistic effects. Kerosene can normally be emulsified in water with silica, but if carbon black is present no emulsion can be made. Water can be emulsified in kerosene using carbon black; the presence of alumina will break the emulsion. If silica were present, no emulsion could be made.

It is such highly specific effects as these which make it difficult to reduce cleaning technology to simple terms and procedures.

Removal by washing requires that the solid-particle-dirt be simultaneously removed with the oil, or be left behind in an unwettable condition, on a wettable surface.

It is possible to wet the dirty surface with a solvent which can penetrate the oily dirt (by mutual solubility) and carry to the solid-particle-dirt, dissolved matter absorbable by the surface of the latter. With properly chosen material this penetration can be almost instantly effected, and the solid-particle-dirt can be put in proper condition for dispersion in a subsequent alkaline bath.

The recent remarkable syntheses of new solvents such as the chlorethylenes, and their derivatives, glycols and glycol ethers, triethanolamine, the availability of alcohols such as butyl and amyl, together with their esters, at greatly lowered prices, and an increased understanding of the phenomena concerning penetration, wetting, emulsification, and deflocculation — or, in a word, detergency—has led to the development of new types of metal cleaning materials which are an answer, in some cases, to the above second question.

My answer to that question at that time was pre-treatment with a sulfonated oil soap dissolved in a high boiling coal tar solvent. This worked fairly well on certain types of dirt, particularly buffing compound, in deep background work. This answer was far from perfect, however, and of rather limited application. Utilization of newly available materials has greatly increased the utility of this process. Improvements in the production of hydrocarbon solvents by petroleum distillation have also been of great aid.

A paper was presented at the Chicago meeting of the American Chemical Society, September 12, 1933, by Sweeney & Tilton,

on "Properties of Hydrogenated Solvent Naphthas." The hydrogenated petroleum solvents surpass the usual petroleum solvent naphtha in solvent power, and compare favorably with coal tar solvent naphthas.

This cleaning process in its present state consists in pre-treating the dirty work by a dip in a solvent mixture called Magnusol, containing a penetrating agent, interfacial tension depressant (against water) and an emulsifying agent, all dissolved in a mineral spirit. This dip may be cold, but penetration is more rapid if warmed to 140°F. After removal and draining for a short period (about 30 seconds) to avoid excessive "drag-out", the work is simply rinsed, water promptly breaking up and removing the "pre-treated" dirt film. A pressure rinse is desirable.

This method has been used for removal of slushing oil, drawing lubricant, polishing and buffing compounds, lubricating oil. These photographs will show the quality of results produced. A chemically clean surface is not produced; a thin film of oil remains from the solvent. This is readily and completely removed by the usual alkaline cleaning bath or electro cleaner. This method is not suited to work which cannot be handled so as to drain free upon removal from the solvent.

Results must always be balanced against costs. The following figures will be of interest in this connection:

At room temperature (70°F) on flat steel sheets with a 15-second immersion and a 3-second draining period after removal, 100 square feet are cleaned with 15½ ounces of solvent. Under the same conditions, but with a 30-second draining period, 100 square feet are cleaned with 7 ounces of solvent.

With the solvent at 140°F, a 5-second immersion and a 30-second draining period, 100 sq. ft. require 8½ ounces of solvent.

Although viscosity is less at the higher temperature, and drag-out less, and draining better, slight solvent loss by evaporation offsets these.

This figures out to a solvent cleaning cost of two to four cents per 100 square feet.

Where wiping or brushing or scouring operations are involved and are eliminated by this solvent cleaning method, the labor savings several-fold offset the solvent cost. This is of the same order of magnitude as figures for electro-cleaning, which would run around two cents for material per 100 square feet cleaned.

For costs of vapor degreasing with trichlorethylene I have no data on costs per unit area cleaned, but some related figures I have picked up may be of interest. Solvent loss runs from 3 to $3\frac{3}{4}$ gallons per ton of metal degreased. This is from about $2.20 per 1,000 pounds to $2.70. Using the figure of 1,600 square feet per gallon given us last night, it would figure out approximately ten cents per 100 square feet for solvent cost.

Another method of removing solid-particle-dirt is by electrolytic cleaning. Solid particles, particularly when of colloidal dimensions, when immersed in aqueous solutions, may become electrically charged by absorption of ions from the solution. The extent of this adsorption and the charge of the ion adsorbed is specific for different materials. In general, most particles adsorb positive ions in acid solutions and take on a negative charge in alkaline solutions. Being thus charged, such particles will be attracted by an electrode of opposite charge and repelled by one of like charge, giving rise to the phenomenon of the movement of charged particles through the solution which is known as electrophoresis.

Electrocleaning practice is undergoing some change. It used to be that cathodic cleaning was very generally employed, the argument being that because the volume of hydrogen liberated at the cathode was double that of the oxygen liberated at the anode, that there was twice the action. This is true, but less importance is now attached to the scouring action of the evolved gas, and more to the "plating off" effect of solid particle dirt. Avoidance of the difficulties attendant upon hydrogen impregnation of the metal as cathode are also avoided.

Steel, brass and copper are today being cleaned anodically with improved results. By using a subsequent sulfuric acid dip passivity of the metal surface is removed. Lower current densities may be found to be as satisfactory as the heavy ones now usually employed to get copious gas evolution. One operator reports just as satisfactory cleaning at 20 amperes per square foot anodically as at 40 or 60. Metal such as zinc, aluminum, or diecasting alloys must be cleaned cathodically, as they corrode anodically. Such oxidation as occurs on brass and copper is removed by a following dilute sulphuric acid dip.

At the present time electrocleaning is receiving fresh attention abroad. Recent numbers of "Galvano," a French technical

journal for the electroplating field, have contained several articles on this subject.

For many years some manufacturers of metal cleaners have used sodium silicates as a source of alkalinity in their products. Sodium metasilicate is a relatively new name on the chemical list. It is old, however, as a component of metal cleaners.

An even better source for buffered alkalinity at high pH levels is the sodium ortho-silicate, and combined with wetting and emulsifying agents it forms most effective metal cleaning compounds.

Silicon can form a large number of different salts. A moment's discussion of these may clarify matters for those who have left their chemistry some years back.

A combination of silicate and phosphate, or silicate and borate, as the alkaline ingredient of a metal cleaner, is believed to be greatly superior to simple silicate. Boron is somewhat similar to silicon in its ability to form a range of complex salts of differing structure. Phosphates are not known to have this property, but there is a possibility of its existence.

There is some characteristic property of such ions as phosphate, borate, etc., which has specific and often dominating effects in emulsification phenomena. There is no real understanding of this; all we know so far is that the presence of these under certain conditions produces certain results.

The firm of Henkel of Dusseldorf dominates the metal cleaning field in Europe. Their line of metal cleaning preparations is called "P_3". It consists of silicate-phosphate combinations of varying alkalinity, together with appropriate wetting and emulsifying agents.

The degree of alkalinity for different types of work may be of interest.

	pH at 20°C		
Type Cleaner (All Silicate-Phos.)	4%	2%	1% Conc.
Hand washing jobs	11.8	11.6	11.4
Al, Sn, Zn	12.3	12.1	11.8
Brass	12.8	12.6	12.4
"All-Round" Brass & Steel	13.1	12.8	12.6
Steel	13.2	13.0	12.7
Heavy Duty	13.4	13.2	13.0

The rinsing power of such combinations is good and exceeds that of the simple alkalies. In mentioning rinsing, the point of surface tension comes up again. Cleaning solutions with low surface tension rinse very much better than solutions of alkalies. No alkali or alkaline salt reduces the surface tension of water. And neither do they reduce interfacial tension against oil, in spite of many claims to the contrary.

Two 4-ounce/gallon solutions of metal cleaner (silicate-phosphate) identical except that one contained a small amount of wetting agent, were submitted to the following experiment:

Metal plates were immersed in them and put through first, second and third rinses by a uniform procedure. Samples from the rinses were titrated after the passage of 100 square feet of metal. The following graph shows the effect of surface tension lowering upon drag-out and drag-over. The same experiment was repeated, using a caustic soda solution of equal molal concentration.

This paper has only touched briefly upon some of the more important recent developments concerning metal cleaning. This field, like all others, is subject to change. At this particular time changes seem to be numerous and significant. (Applause)

Historical Dynamo Wanted
for Temporary Exhibition

The undersigned desires to borrow, for exhibition at the coming Annual National Convention of the American Electro-Platers' Society to be held in Bridgeport, Connecticut, June 10th to 14th inclusive, 1935, an old, if not the very oldest electroplating dynamo located in New England. For the purposes of this exhibition it is not necessary that the dynamo be still in regular use, although it appears worth while to exhibit a machine which is sufficiently preserved to indicate clearly that it has served to do commercial electroplating.

Anyone owning a dynamo filling the description given above or knowing where such a machine may be located will confer a favor and perhaps assist in the historical and educational feature of the Convention by communicating promptly with

R. T. PHIPPS, Manager of Exposition
271 Grovers Avenue, Bridgeport, Connecticut.

Suspended Matter *in Plating Solutions*

By J. M. COSGROVE
Noblitt-Sparks Industries, Inc.
Columbus, Indiana.

Read at Chicago Branch Annual Meeting, January 14, 1935.

AN examination of a typical report form having to do with a plating solution, brings out an interesting point. Take that for instance shown on page 598, of Blum and Hogaboom, latest edition.

The experiment is carefully numbered and dated. Volume of solution is given in gallons, Temperature in degrees, pH in points, Resistivity in ohm-centimeters, Nickel Sulphate in Ounces per Gallon and other constituents of the bath likewise; current in amperes, time in minutes, E.M.P. in volts; cathodes are numbered, their size, shape and area being given in the requisite units; etc. etc. etc.

One variable is mentioned without being assigned a unit. The appearance of the solution is described as clear or that there is a yellow precipitate.

But is this matter of clearness or turbidity important? The answer to that question is given by Mr. W. H. Phillips in a paper read, incidentally, at the annual meeting of this branch on Feb. 27, 1932. The first five words of his paper constitute a simple declarative sentence and are as follows: Pitting is caused by dirt. I believe that the point that pitting is important is so self-evident as to require no proof at this stage of our knowledge of plating. Now if pitting is caused by dirt, (suspended matter) (turbidity), and pitting is important, which it is, then our time is not misspent when attention is directed to turbidity.

Now let us leave this for a moment and consider another drawback in the life of the average plater. —Roughness. The everyday experience of all platers is fully confirmed by the excellent photomicrographs in Dr. E. M. Baker's paper, Photomicrographic Study of Rough or Nodulized El. Dep. NI — Trans. Am. Elc. Soc. Vol. 53, 1928, that roughness is caused by the selfsame culprit — dirt. In general it is believed that the nodules in a result of suspended particles in the bath which may come in contact with the

surface of the metal after deposition has started. To quote from another paper by Dr. Baker, "Rust Resistance of Nickel Plated Steel."------ "tho I have no specific data to offer, I am firmly convinced, that iron hydrate sludge which is almost always formed from iron in solution, is the cause of most of the erratic defects that are evidenced by the *low saltspray ratings* of work plated under conditions that would otherwise give a high quality of plating."

— so — Pitting, Roughness, Low Salt Spray are all tied in with this matter of turbidity, so — of its importance there surely can be no further doubt. Yes, gentlemen, I think that turbidity is important enough to merit a place on this typical report and on every report of its type hereafter, and I think that whoever received such a report wherein the turbidity of the solution is not stated specifically should be fully justified in returning the report to its originator with the notation — "Incomplete," and if the excuse be offered that there is no unit available, and no method available of measuring turbidity which is rapid and simple enough for routine reports of this kind, then there is surely no time better than the present to see what can be done about it.

It doesn't take us long to find out, if we look in the proper sources, that a great deal of work has been done on turbidity measurements, especially as regards sewage and water. The methods applied thereto as described for example page 448 ff of volumetric Analysis by Sutton, 11th edition, are long and tedious, and involve accurate weighings. They are not ideal for our purpose.

The kindness of the E. H. Sargent Co. enables me to show at this time an apparatus used for measuring turbidity of river water. It consists of a ribbon with a needle attached horizontally at the lower end which when immersed in the water to be measured, disappears at a certain depth, depending on turbidity, which is marked in parts per million on the scale. Due to the color involved in plating solutions, the method is not applicable to our problem, but we do get a hint as to a suitable unit (parts per million).

We next see an apparatus now commonly used in the laboratories of many municipal filtration plants. It consists of a standard light source and a glass cylinder, graduated again in parts

per million. The solution to be measured is poured into the cylinder till the light disappears. The method has the desirable attributes of speed and ease of manipulation but as before, color interferes.

Luckily we are not ou of apparatus yet and we can now proceed to examine one which will enable us to run a turbidity determination, quickly, accurately and where neither color nor any other attribute of the solution can interfere with the results. The method has been in constant use for a period of several months with complete success.

The piece of apparatus referred to is the centrifuge, in which a sample of the solution is rapidly rotated and any suspended matter is thrown by centrifugal force to the bottom of the flask, the stem of which is graduated, thus permitting the turbidity to be reported in whatever units we may choose. Therefore the one remaining characteristic of this solution which up to now has been indefinite, is now made definite and certain. We can set standards of turbidity just as we have set standards for the other variables in our solutions.

This works to the advantage of the executive who has authorized the outlay of considerable sums for filtering equipment. He is now in a position to demand that turbidity be kept at a certain minimum.

The harassed plater on the other hand, can walk in to his superior with a puncture proof story, he no longer has to stick to generalities. The facts can be laid on the table in specific terms, perhaps somewhat as follows:

Mr. Executive, the turbidity of your solutions are at this point of the curve at the present time.

At the present rate of increase we will have reached a crisis next Tuesday morning, at which time it will be necessary to shut the department down unless something is done towards lowering this figure in the meantime.

Moreover, considering the above mentioned investment in filtering equipment, a test such as described will permit a check on the efficiency of such equipment, for who among us has not at some time or other had the questionable pleasure of running a filter with a hole in one or more of the bags.

In short, turbidity can be measured, by the centrifuge, a unit

has been suggested, parts per million, and when a variable such as this can be recorded and plotted it is more likely to be brought under control. And when turbidity, in addition to the other variables, is brought under control, I speak from experience, particularly as regards nickel solutions, the difficulties previously mentioned tend to be reduced to minimum, namely roughness, pitting, and low salt spray, with a corresponding increase in the quality of the deposit.

Surely, therefore, turbidity measurements are worth the serious consideration of the members of The American Electro-Platers' Society.

The Electrolytic *Treatment of Zinc*

By JOSEPH SCHULEIN

Read at Chicago Branch
January 19, 1935

WE are all familiar with the valuable research work which this Society is sponsoring. We all know that our future welfare is closely linked to that research: and we also know that we will all benefit by the establishment of plating standards and specifications. The thing we do not know, however, is what the future holds beyond specifications as to the thickness of plate, current density, solution analysis, and the other things with which the present research is concerned.

It is well known that practice follows theory; and as our theories are always changing (at times gradually and at others drastically) practice is continually changing also. I believe that we are at the beginning of a distinct change in our methods of approaching the problem of corrosion resistance; a change which will eventually affect all of us concerned with the deposition and treatment of metal.

I have several reasons for believing this: one reason I am going to tell you about, and another I am going to demonstrate to you.

The most important reason is based on a report made to the last meeting of the Electrochemical Society by Prof. O. P. Watts.

Dr. Watts has now shown that corrosion does not take place by electrolytic action alone; free oxygen is necessary for the process. Potential differences in themselves are quite harmless when oxygen is absent from the electrolyte. That statement sounds and is very simple; but you and I wont even be aware of the changes we will see in the plating art until many years have passed. We hope we will then see extremely thin coats outlasting our present day heaviest plates.

One of the big changes we will see will be in the preliminary treatment of the base metals; and today I would like to demonstrate to you one of the first uses of alternating current to invade the plating room.

A few years ago it was noticed that zinc, when electrolyzed as an alternating current electrode in a bath substantially the same as is now used for chromium plating, was peculiarly effected. The surface of the zinc was very noticeably darkened; indeed some samples were produced that were jet black. Now, since chemical literature listed no black compounds of zinc, it was at once recognized that something unusual had been formed. Further examination showed startling characteristics.

The process of producing this coating is in itself extremely simple. The bath used is a chromic acid solution containing about 1% (by wt. of CrO_3) of sulfuric acid. The solution concentration may vary over wide limits; we have used 10 oz./gal. and 40 oz./gal. very successfully. You will recognize the solution used as the well known chromium plating bath. The solution may be used at room temperature, and the voltage applied is low a. c. of any frequency from 25 to 1000 cycles, the standard 60 cycle single or polyphase current being very satisfactory.

In operation, the zinc or zinc coated article to be treated is made one electrode with a sheet of iron as the other electrode; or if desired, two zinc articles to be treated may serve as electrodes with the current flowing between them. The action is not critical, and by the adjustment of the current the proper effect can be produced in two or three seconds or in several minutes as desired. Thus the process is very satisfactory for continuous use, such as in the treatment of galvanized wire, where the wire may be treated immediately after galvanizing and at the same rate as the galvanizing itself.

The only visible effect of the treatment is the coloring of the

zinc to a deep black, even after a short treatment of three seconds. By careful analytical balance methods we find that there is no appreciable change in weight after treatment, nor is there any addition to the thickness. The zinc surface is visably affected to a depth of approx. 0.00004 in. (0.001 mm.) as determined by lapping off the colored product and again measuring the thickness. After treatment we find the single potential of zinc in N KCl at 20° C is reduced about 20 millivolts. All local couple effects are apparently removed or very much reduced. The zinc seems to acquire a relative passivity thruout the surface layers and acts not as if there were an outer layer of a different material but as a homogeneous solid.

The coating produced on the zinc is highly resistant to chlorides, e. g. NaCl, and does not readily form the usual zinc salt products of corrosion as on untreated zinc surfaces. The surface tension of the treated surface is quite distinct from that of the untreated; it does not wet as easily as ordinary zinc.

The Robert W. Hunt Co., testing engineers, have recently completed a series of corrosion tests on specimens treated by this process. The results of a set of these tests are shown in

TABLE 1.
Corrosion Tests on Treated and Untreated Electrozinced Stripped Steel

Sample Number	Size of Sample		Weight of Zinc Coat		Definite Rusting Appeared (15% of area)	
	in.	mm.	oz./sq.ft.	g./dm.	Untreated	Treated
1	1/2 x0.02	12.7x0.51	0.0203	0.062	After 1 day	After 6 days
2	1/2 x0.02	12.7x0.51	0.0446	0.136	After 2 days	After 12 days
3	9/16x0.039	16.8x0.99	0.0604	0.184	After 3 days	After 15 days
4	15/32x0.013	12.0x0.33	0.107	0.325	After 5 days	After 27 days
5	3/8 x0.025	9.5x0.64	0.137	0.416	After 7 days	After 34 days

When these results of Table 1 are plotted, it is seen that there is a decided right line relation between the days in salt spray and the thickness of zinc for both the treated and untreated specimens. Instead of merely an additive effect due to the treatment, which might be expected, we obtain a multiplication of the corsion resistance of about 5 to 6 times in this particular test which is the standard Navy salt spray test.

A peculiarity of this treatment of zinc is that the same results are not produced by the use of direct current, making the zinc either anode or cathode. At first it was believed that the coating was substantially an oxide of zinc; however, tests not yet com-

pleted indicate that the compound is probably quite complex. The mechanism of the formation of this compound is not yet fully understood.

Now, this coat is not something deposited on the base metal. It is rather a change in the nature of the base metal for a very slight depth. I cannot demonstrate to you the fact that the corrosion resistance is greatly increased in as short a time as is available now, but I can demonstrate that the surface has been greatly changed in another way.

Dr. Watts has shown that oxygen is necessary for corrosion. If we have a substance that is inert to the action of oxygen, either directly or indirectly, we would not have any corrosion. Now, a fast way to oxidize, or corrode, anything is to burn it. I have here a piece of galvanized sheet iron. I hold it in the flame of the blow torch, and what happens? The zinc is oxidized to zinc oxide.

I have here another piece of the same sheet which has been electrolyzed with a. c. for five seconds. The penetration is not over 0.0004 in., yet see what happens—at red heat—now cooled and unchanged. No oxygen has combined with the surface that time. That little film has stopped that severe oxidation. Now

Milwaukee Branch

Annual Smoker and Educational Session

at the Hotel Schroeder (Green Room)

Saturday, March 30, 1935

at 8 o'clock P. M.

THE Educational program will be followed by Entertainment and refreshments for which Milwaukee is famous.

A small fee of $1.75 per person will cover all charges.

Address all communications to
Dan Wittig, 1221 N. 3rd St., Milwaukee, Wis.
See page 51 for details

this, of course, is direct oxidation, and if kept up long enough the film will fail; it is not perfect protection, but it is many times better than the untreated material.

Wouldn't it be nice if we could treat our base metal so that it wouldn't corrode and then put a thin film of a non-tarnishing plate over it? That's what we're coming to. I'm sorry I cannot tell you how to place on this material, and I think we'll have to stick to heavy plates until we know a lot more than we do now.

Remember that this effect was noticed only because the coating happened to be colored. What possibilities are we missing in these surface films because they are not colored or because they are perhaps too thin to change the appearance of the base metal. We are really only groping around in the dark in this electrolytic treatment business, but someone in the future will show us how, and then our plating ideas of today will be as obsolete as todays research will make our standards of a few years ago. But I do believe we can rely on this that the plate of the future will be a very thin one applied over a pre-treated base metal. The research of this Society should lead the way.

15th Annual Banquet and Educational Session

Nelson Sievering, Chairman

Newark Branch

Hotel Douglas (Hill St.)

Saturday, April 27, 1935

Morning Session — 9.30

BEN McGAR, (Chase Brass Co.)
"Recent Developments in Manufacture of Brass"
DONALD WOOD, (Reed & Barton)
PAUL STRAUSSER (Bureau of Standards)
"New Dipping Method for Zinc and Cadium Coatings"

Afternoon Session — 2.30

WM. H. PHILLIPS (General Motors Co.)
"What Happens in a Plating Solution"
Mr. MORROW (Egyptian Lacquer Mfg. Co.)
will furnish entertainment

All talks will be illustrated

In the evening the Banquet Committee, under Horace Smith, has planned a wonderful night of real fun.

The Abstract Section

T. F. SLATTERY, *Chairman, Program and Educational Committee*

Methods of Suspension in Electrodeposition Practice. C. F. J. FRANCES-CARTER and B. J. R. EVANS. Jour. Electro-depositors' Technical Society (preprint), vol. 10, p. 1; 1935. The authors consider the question of hanging articles in the tank and the advantages and disadvantages of the commonly employed types of suspension. They recommend the use of special suspenders, jigs, or racks. Whenever it is feasible to do so, the general rules governing the design of a suspender for any plating process are given as follows:

(a) It must be a good conductor of electricity and of sufficient capacity to carry the required current without undue temperature rise.

(b) It must be sufficiently strong mechanically to carry the article being plated, and to stand up against factory wear and tear.

(c) Its construction must be electrically sound, i. e., all joints must be well made and each article guaranteed electrical contact.

(d) It must allow the work to be arranged in such a manner that the current density is as uniform as possible, in that the lines of current are free to reach all parts of the work by equidistant paths, and that "shading," or areas of unplated base metal, cannot occur.

(e) It should hold the articles sufficiently rigidly to prevent them swinging about and touching when in agitated solutions.

(f) It must allow adequate drainage of solution from the articles.

(g) The metal of construction should not be affected chemically by the solution and conversely.

(h) Whenever possible it should be covered with an insulating material to prevent the waste deposition of metal. C. KASPER.

The Deposition of Zinc-Cadmium Alloys from Alkaline Cyanide Solution. LESLIE WRIGHT and J. RILEY. Jour. Electrodepositors' Technical Society (preprint) vol. 10, p. 41; 1935.—The authors review the previous work on zinc-cadmium alloy deposition, and some of the underlying principles. They

Then . . . **rule o' thumb**
Now . . . **rule of science**

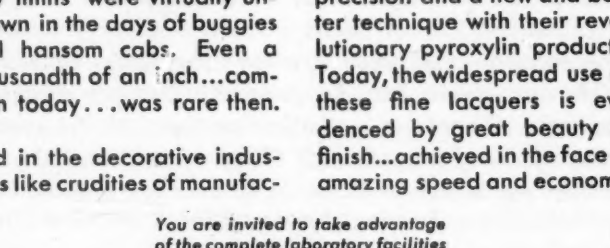
WHAT we know as "close limits" were virtually unknown in the days of buggies and hansom cabs. Even a thousandth of an inch...common today...was rare then.

And in the decorative industries like crudities of manufacture existed till Zapon brought precision and a new and better technique with their revolutionary pyroxylin products. Today, the widespread use of these fine lacquers is evidenced by great beauty of finish...achieved in the face of amazing speed and economy.

You are invited to take advantage of the complete laboratory facilities in Stamford and North Chicago

Eastern Sales
THE ZAPON COMPANY
A Subsidiary of Atlas Powder Company
STAMFORD, CONN.

Western Sales
ZAPON-BREVOLITE LACQUER COMPANY
NO. CHICAGO, ILLINOIS



INDUSTRIES *using* ZAPON FINISHES
Clocks
Caskets and Casket Hardware
Builders' Hardware
Instruments, Musical and others
Lighting Fixtures
Metal Novelties
Electrical Goods

INDUSTRIES *using* ZAPON FINISHES
Paper & Paper Novelties
Radio & Radio Parts
Silverware
Sporting Goods
Wood Products
Wood & Metal Furniture
Toys
and many others

ZAPON LACQUERS ENAMELS

LACQUERS

Please mention THE MONTHLY REVIEW *when writing*

performed experiments on the preparation of zinc-cadmium alloys. The deposits studied were high cadmium (70%) alloy and not the high-zinc, low-cadmium alloys studied by previous American investigators. The cyanide solutions used were high in cadmium and low in zinc, and contained free alkali. It was found that an increase in temperature from 20 to 40°C increased the content of cadmium in the deposit. As the current density was increased from 4.5 to 10 amperes/ft² the cadmium content of the deposit increased. An increase in the cyanide content also increased the cadmium content of the deposit. However, increasing the alkali content decreased the cadmium content of the deposit and also the cathode efficiency. Cadmium is preferentially deposited from solutions containing cadmium and zinc cyanides. The cadmium was added to the solution in the form of the hydroxide, the zinc was added in the form of the oxide. A typical solution employed by them is:

	g/l	oz/gal
Cadmium (Cd)	11.75	1.5
Zinz (Zn)	4.8	0.7
Cyanide (CN)	35.	4.7
Potassium hydroxide (KOH)	10.	1.5
Cerelose (corn sugar)	2.	0.25

C. KASPER

Research of Electrodeposition of Metals, W. R. BARCLAY. R. S. HUTTON and H. MOORE, J. Soc. Chem. Ind. **53**, 1028, 1934.—In this article (also published in the London Metal Industry, Nov. 30, 1934), the status and plans for researches on electrodeposition in England are explained. During recent years the British government has supported such researches at governmental laboratories such as Woolwich and Farnborough, and at universities. The results have been published, mostly in the Journal of the Electrodepositors' Technical Society. It is now recommended that future researches on these subjects be directed by the British Non-Ferrous Metals Research Association, and that the necessary funds be provided partly by industry and partly by the government. The annual subscription requested from interested manufacturers is 1000£ (about $5000). (NOTE—This plan is very similar to that carried out in the U. S. during the past few years through cooperation of

the American Electro-Platers' Society and the National Bureau of Standards. It is interesting to note that the proposed budget for the British industry is the same as that now being raised by the Research Committee of the American Electro-Platers' Society for the extension of the exposure tests to non-ferrous metals. Abst.).

W. BLUM

Rapid Electrolytic Patina on Copper. C. L. CRAIG and C. E. IRION. *Metals and Alloys*, **6**, 35, 1935.—Methods recently proposed for producing a green patina upon copper, especially on large areas such as roofs have depended upon the direct application of a reagent such as ammonium sulphate, which, under specified conditions forms coatings of the desired color, with approximately the same composition as the product finally formed naturally, especially in industrial locations.

The research conducted at Battelle Institute and described in this paper, resulted in an electrolytic method that has proven rapid and satisfactory. The cleaned copper is made anodic in a solution containing 2 to 10 percent by weight of sodium bicarbonate. The initial current density is about 150 amp/ft^2. The method can be applied to copper roofs by surrounding a copper covered roller with layers of cloth that are kept saturated with a 5 percent solution of sodium bicarbonate. The roof is made the anode and the roller the cathode, with a potential of about 40 volts.

W. BLUM.

Recent Advances in Metal Cleaning Technology. By R. W. MITCHELL. "*Metal Cleaning & Finishing*", Vol. 7, No. 1, January, 1935, P. 9-14.—Physical properties and corrosion tests on six available solvents are given. A new cleaning method consists of immersing the work in a solvent containing an emulsifying agent followed by a water rinse and the conventional alkaline cleaner. The cleaner is not given. Another type of cleaner consists of a soluble soap which will make water insoluble solvents mix with water. A formula of this type used by the Navy Department for cleaning aluminum consists of—

Cocoanut fatty acids (double distilled)	— 12%
Oleic Acid	— 22%
Triethanolamine Diethylene Glycol Mono Butyl Ether	— 15%
Aliphatic Hydrocarbon (B.P. above 180°C.)	— 20%
Water	— 14%

E. T. CANDEE.

Developments in Electrolytic Pickeling. By Dr. A. E. CHESTER and C. J. KRISTER. *"Metal Cleaning & Finishing"* Vol. 7, No. 1, January, 1935, P. 30-36.—The "Mansdell", "Hanson-Munning" and "Bullard-Dunn" methods are briefly mentioned. Dr. Fink improved the last mentioned process by using a silicon alloy anode which keeps the iron in the reduced condition. Chrome alloy steel is pickeled by the anode treatment in an alkaline phosphate solution containing Pb, Sn, Zn or Cd. Rogers has pickeled high speed steel anodically in a bath containing 4.06 oz. per L. NaOH plus .53 oz. per L Citric Acid at 25 a/sq.ft. followed by a quick 6-10 N Hcl dip. Esin and Balabai anodically pickeled transformer steel in 30% H_2SO_4 10 a/sq.ft. 0.2—0.6 V. When the voltage raises to 3-4 V. the work becomes passive. The Ferrolite Pickling System uses A.C. in a solution 5-10% H_2SO_4 plus 10% of total acidity as gluconic acid 160-180° F. E. T. CANDEE.

The Corrosion of Iron and its Electrochemical Potential. By N. NEKRASSOW, I. STERN and Z. GULANSKAJA, *Zeitschrist für Elektrochemie*, Vol. 41, No. 1, pages 2-9, 1935.—The corrosion of metals in moist atmospheres has been recognized as a result of the local elements present. In contrast to most previous investigators, the authors studied the change in electrochemical potential of the iron during the course of the corrosion. Several investigators have shown that corrosion of iron strongly decreases in solutions whose pH is over 9.0. This value is close to the solubility product of ferrous hydroxide, namely pH# 9.2 above which the solubility is very low resulting in the formation of a protective layer on the iron. The pH range from 5 to 9 is one in which there is little variation between pH and corrosion. The pH corrosion values are strongly influenced by the type of anion present. Chlorates raise the value and phosphates lower it. The meta-silicate ion SiO_3 gave very unexpected results. Meta-silicate proved to be one of the best anti-corrosion agents providing its concentration was not less than .03%. Acetate and oxalate ions also have pronounced protective effects.

In summary, a displacement in the potential of iron towards the negative side (Hydrogen side) is always accompanied by an increase in corrosion velocity and a displacement towards the positive (oxygen or passive) side leads to a retarding of corrosion.

WALTER R. MEYER.

Are Angled Anodes of Advantage in Electroplating Baths? By EUGENE WERNER. *Oberflächentechnik*, Vol. 12, No. 1, page 1.—The author describes the relative advantages and disadvantages of angled nickel anodes in comparison to the proven cylindrical and flat anodes. The pitting of nickel electrodeposits is discussed in relationship to anode corrosion and the acidity of the bath. Werner recommends the addition of .1 oz. per gallon of sodium chloride to a pitting nickel solution, which treatment is regarded as being more effective than the addition of peroxide, perborate, or nitrates. It is also important to adjust the pH and metal content. The flat or cylindrical anodes are to be preferred over the angled anodes due to a lesser tendency to form nickel peroxide, to their greater volume and more even distribution of current lines. Angled anodes corrode in the middle as rapidly as the standard forms and leave a much less usable residue. The possibility of the use of higher current density with angled anodes is limited by the composition of the solution. The paper presents a fine discussion of pitting, rough or cracked deposits, influence of bath composition and the corrosion of nickel anodes and the abstractor recommends it to those members who are able to read German.

WALTER R. MEYER.

The Protection of Metals. *Galvano*, No. 32, December, 1934.—This special number of "Galvano" contains a summary of processes, electrolytic and non-electrolytic, used for the protection of metals, including a section on the preparation of surfaces for treatment. The use of trichlorethylene, of hot alkaline cleaners, and of a degreasing-coppering bath, for removing grease films are commented on favorably. Acid pickling sand blasting and polishing are discussed briefly. Copper plating before nickeling is of value chiefly to cover up flaws in the supporting metal. Its protective influence is now largely discredited. Acid baths are more and more displacing the alkaline type. Many minor uses of copper plating are listed. Nickel plating in spite of much study remains uncertain as to actual protective value, though it can be said safely that "hot" baths are to be preferred to the "cold" baths, and the protection increases with increase in the thickness of the deposit. Early expectations as to the protective value of chromium deposits have been dispelled, and chromium is now used almost entirely

in conjunction with nickel. Recent investigations have shown that the protective value of the chromium varies with the thickness of the underlying nickel. The use of the "hot" bath is recommended as superior to the "cold" bath which is widely used in France. Cobalt, though little used because of its high price, makes a good under-coat for chromium. It deposits very rapidly, is harder than nickel and polishes easily. Cadmium is displacing zinc as a protective coating, because of a better color and because of its recently developed bright deposits. Cadmium deposits very rapidly and the bath has excellent throwing power. Discoloration and brittleness of its deposit are largely overcome by "fixing" with a chromic acid solution. The precious metals are used in plating jewelry, but other industrial applications are limited by their high price. Light films of gold plated over nickel have been shown to add much to the protection afforded the supporting metal. Lead and tin also find limited uses as protective coatings. Non-electrolytic processes for metal protection are summarized in the same manner. These include hot galvanizing, hot tinning, hot leading, metal spraying, cementation, and phosphatation.

C. T. THOMAS

A. P. Munning *Returns to the Plating Industry*

Due to a continually increasing amount of business and various problems connected with the development of new processes, etc., the Hanson-Van Winkle-Munning Company of Matawan, N. J., has arranged to have A.P. Munning who was the Chairman of their Board of Directors until March 1930, again become actively associated with them. It is understood that Mr. Munning will occupy a high executive position, and will devote himself to the larger and broader aspects of the Company's business. There will be no change in the officers or directors of the company.

In the discussion of this matter with Mr. Munning he asked us to convey his best wishes to all of his old friends and associates in the industry, and stated that he hoped to be of such service as he possibly could render to everyone connected within or without the industry in any matters relating to the improvement ot the industry or the parties therein.

HARSHAW
QUALITY
CHEMICALS

PURITY

of anodes and chemicals is of *vital importance,* if you are striving for *rust resistant uniform* plated coatings.

Recognizing this, the Bureau of Standards and the laboratories of large manufacturers have set definite purity specifications on plating materials.

The purity of Harshaw products is *guaranteed* to exceed *any commercial specifications we have ever seen.*

By insisting on Harshaw tested anodes and chemicals, you assure yourself of dependable quality plating.

THE HARSHAW CHEMICAL COMPANY

Manufacturers, Importers, Merchants
Offices and Laboratories: CLEVELAND, OHIO
Quality Products Since 1892

New York, Philadelphia, Chicago, Detroit, Pittsburg
Cincinnati, East Liverpool, Los Angeles, San Francisco
Plants at Cleveland, Philadelphia and Elyria

Please mention THE MONTHLY REVIEW *when writing*

Principles of Chemistry

For ELECTROPLATERS

As indicated in the January REVIEW, the Educational Committee decided to publish this series of lessons on Principles of Chemistry, in order to stimulate thought and discuscusion. The chairman will be glad to receive comments from Branches that have discussed these lessons, and suggestions for improving their form or subject matter.

Some requests have been received for answers to the problems. It is believed that if these are discussed in meetings, with the assistance of persons with chemical knowledge, the correct answer will be reached. If there is any uncertainty regarding the correct answers, the chairman will be glad to furnish additional information and advice.

T. F. SLATTERY

LESSON III
Chemical Symbols and Calculations

1. Symbols and atomic weights of elements:

(a) Each element is represented by a symbol, for example S for sulphur, H for hydrogen, and O for oxygen.

(b) This symbol also represents one atom of the element.

(c) Each atom of a given element has the same weight.

(d) The *relative* weights of the atoms of elements are known as the *atomic weights*. For example, the atomic weights of hydrogen, oxygen and sulphur are respectively 1, 16, and 32; that is an atom of oxygen weighs 16 times as much as an atom of hydrogen; and one of sulphur weighs 32 times as much as one of hydrogen.

(e) Symbols and Atomic Weights of Common Elements (to nearest whole numbers).

Name	*Symbol*	*Weight*
Aluminum	Al	27
Barium	Ba	137
Boron	B	11
Cadmium	Cd	112
Calcium	Ca	40
Carbon	C	12
Chlorine	Cl	35

Name	*Symbol*	*Weight*
Chromium	Cr	52
Copper	Cu	64
Gold	Au	197
Hydrogen	H	1
Iron	Fe	56
Lead	Pb	207
Magnesium	Mg	24
Mercury	Hg	201
Nickel	Ni	59
Nitrogen	N	14
Oxygen	O	16
Phosphorus	P	31
Potassium	K	39
Silver	Ag	108
Sodium	Na	23
Sulphur	S	32
Tin	Sn	119
Zinc	Zn	65

2. Formulas and Molecular Weights of Compounds:

(a) The *chemical formula* of a compound includes the symbols of the elements present, and the number of atoms of each element in a molecule of the compound. The formula of water is H_2O. Hence each molecule of water contains two atoms of hydrogen and one of oxygen.

(b) The *molecular weight* of a compound is the sum of the weights of all the atoms present in a molecule of that compound. The molecular weight of water (H_2O) is $(2 \times 1) + 16 = 18$.

(c) The *percentage composition* of a compound may be calculated from its formula and molecular weight.

Examples:

(1) The formula of water is H_2O. Its molecular weight is $(2 \times 1) + 16 = 18$. Hence 18 parts *by weight* (grams, pounds, tons, etc.) contain 2 parts by weight of hydrogen and 16 parts by weight of oxygen. Therefore water contains $2/18 \times 100 = 200/18 = 11.1$ per cent of hydrogen, and $16/18 \times 100 = 1600/18 = 88.9$ per cent of oxygen.

(2) The formula of sulphuric acid is H_2SO_4. Its molecular weight is $(2 \times 1) + 32 + (4 \times 16) = 2 + 32 + 64 = 98$. Hence sul-

phuric acid contains 32/98 x 100 = 3200/98 = 32.7 per cent of sulphur.

(3) If copper sulphate (crystals), $CuSO_4.5H_2O$, costs 5 cents per pound, what is the cost per pound of the copper bought in this form?

Formula - $CUSO_4.5H_2O$.

Molecular weight $64 + 32 + (4 \times 16) + 5 \times (2 + 16) =$

$64 + 32 + 64 + 90 = 250$

The copper content is 64/250 x 100 = 25.6 per cent.

To obtain 1 lb. of copper it will require 100/25.6 = 3.91 lbs. of copper sulphate.

3.91 x 5 cents = 19.6 cents per pound for the copper.

Problems

1 - What is the percentage of silver in (a) silver nitrate, $AgNO_3$, and (b) silver cyanide, AgCN?

2 - If chromic acid, CrO_3, costs 20 cents per pound, how much does the chromium present in it cost per pound?

3 - Calculate the respective percentages of nickel in pure

(a) Nickel sulphate, $NiSO_47H_2O$

(b) Nickel ammonium sulphate, $NISO_4.(NH_4)_2SO_4.6H_2O$

(c) Nickel chloride, $NiCl_26H_2O$

"How It is Done"

Annual Convention and Exhibition

THE next annual convention of the American Electro-Plater's Society will take place at the Stratfield Hotel, Bridgeport, Conn., June 10 to 13,1935, inclusive. The plans already in progress under the supervision of the 1935 Convention Committee indicate that this will undoubtedly be the finest educational as well as social event in the twenty-six years that the Society has existed. To those who are acquainted with the usual high technical and scientific standards of this Society's annual conventions, no more need be said.

It will also be possible for those who attend the convention to enjoy in addition to the papers and entertainment a whole day's trip through some of the largest and most modern metal finishing plants in New England.

Naturally, the full membership of the American Electro-Platers' Society is expected to attend the convention. Non-members who are interested in electroplating and finishing are also urged to attend and receive the benefits of the educational program to be presented, as well as the social contacts.

History and Ideals: The American Electro-Platers' Society was established in 1909, with the object of advancing the art and science of electroplating through the joint efforts of the membership, the latter to include only experienced electroplaters, including platers who are owners of plants, of job shops, executives of such plants or shops, and experienced platers in general. Throughout its history, the Society has led in the progress of the industry. It has branches in all the principal electroplating centers of the United States and Canada. These branches hold regular monthly meetings where scientific and practical information is exchanged, and annual educational sessions where the best of the year's research and experience by members and invited speakers are presented to all who are interested. The National Society holds an annual convention each year, and the 1935 Convention will be the twenty-third. Here are presented for three or four days, the latest information available on the science and practice of electroplating. Many of the papers are by members, and many by invited speakers from research institutions, universities, Government bureaus and branches, etc. Membership in the American Electro-Platers' Society is open to all experienced plating executives whether they are employees or employers. The membership today numbers about 1500, many of whom are owners or executives of plants and shops.

Special Transportation: Plans are now afoot for the arrangement of special fare transportation to the convention city from all parts of America. It will, therefore, profit all who think of going to Bridgeport to keep in touch with the Convention Committee, or with the Branches in their localities, until the arrangements are finally announced.

As a suggestion—why not put aside a small amount of money weekly until the convention time, and make that part of your vacation? You'll want to see Bridgeport in 1935.

Golf: The Publicity Committee is glad to report for the benefit of those that play golf that the Mill River Country Club, which

has one of the finest 18-hole courses in the East has offered its hospitality to members and their friends attending the convention. Those that desire to play may do so at any time from Sunday, June 9th until June 14th inclusive. The Greens fees for the whole day will be the nominal sum of $1.00.

Tercentenary: This year Connecticut will celebrate the three hundredth anniversary of its settlement and there will be formal State functions, exhibitions and festivities in many places with opportunities offered for visits to our industrial and business centers, our public parks and museums, and the seats of learning which have brought fame to our State. This is, therefore, an excellent year to visit the State.

It will be of aid to the Committee if those thinking of attending the convention signify such intentions as early as possible.

The Exhibition will open Monday, June 10 at 1 P.M. and will close Friday, June 14 at 10 P. M. It will be the most complete Exhibition of its kind ever held, bringing together more exhibitors and more visitors than any other similar exhibition.

In the "show" you will see the best and most improved materials, equipment, apparatus and machinery used in the metal finishing field. A number of the educational sessions will be held in a room in the Exhibition building. You will find over seventy-five leading manufacturers and jobbers displaying their products, among which will be many outstanding nationally known concerns.

The New England market, original field of metal finishing, affords an expansive and almost unlimited field for sales opportunities. This Exhibition offers you the opportunity to contact the personnel and buying powers of New England concerns during the period of the Exhibition.

Over 1000 Members

supposed to be working to increase the A. E. S. Membership — but only one new member elected last month. Think it Over.

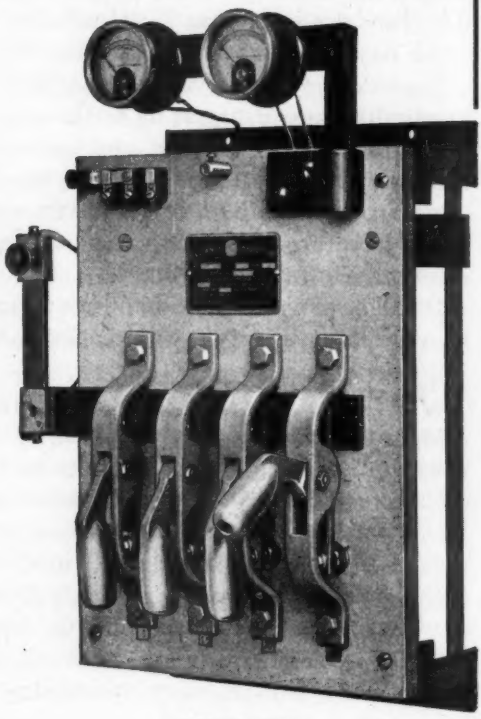
RELIANCE RHEOSTATS

Appearance
Simplicity
Durability

Positive
Self-closing
Contact

Fool Proof
Easiest to
operate

Write for
circular



TYPE CVA

CHAS. F. L'HOMMEDIEU & SONS CO.

MANUFACTURERS
EQUIPMENT AND SUPPLIES
FOR PLATING AND POLISHING

4521 OGDEN AVE. — CHICAGO — 15 S. CLINTON ST.

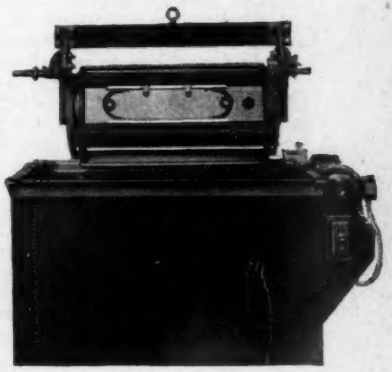
BRANCHES: CLEVELAND, LOS ANGELES

DEALERS IN PRINCIPAL CITIES

Please mention THE MONTHLY REVIEW *when writing*

THE UDYLITE PLATING BARREL

The Udylite Company, Detroit, has just developed a plating barrel for aklaline plating solutions which is said to be outstanding because of its strength, durability and efficiency.



STRENGTH

Strength has been built into this barrel. It is constructed of the strongest possible combination of materials—steel and shock-resistant rubber. The cylinder consists of a framework of steel into which are fitted rubber rails and heads. The entire steel framework is anodically charged so that it does not plate.

Rubber was chosen as the unsulating material for the panels, rails and heads, because it does not disintegrate by absorbing plating solution as do bakelite and woods; because it will resist wear better than any material avaliable for plating barrel construction. The rubber used in the Udylite barrel is a special, shock-resistant rubber, formed, not moulded. Its resistance to shocks and stresses is many times greater than that of ordinary moulded hard rubber.

The combination of steel and special rubber results in a plating cylinder having great strength—far greater strength than it has ever been possible to achieve heretofore. It can be appreciated that the cost of maintaining this cylinder will be very small and that it will continue to operate for an indefinitely long period.

DURABILITY — EFFICIENCY

The durability and efficiency of plating barrels is dependent on the insulation. Proper, efficient insulation eliminates treeing which is the principal cause of barrel destruction and loss of efficiency.

In the Udylite barrel, there is no treeing! All of the current goes directly to the work because of the following reasons:

1—Every part of steel framework is exposed — every part is anodically charged.

2—Cathode lead is encased in continuous, unbroken insulation from contact pins to dangler arbor.(no slip joints).

3—Cast iron hanger from which cylinder is suspended is not integral with or a part of the cathode lead. Consequently, strains in the hanger have no effect on the lead and do not cause its covering to crack. Such cracks in the insulation would cause treeing.

4—Bearing on which the cylinder revolves is anodic and separate from the cathode lead. Therefore, there are no slip-joints to tree and freeze causing the motor to burn out. There are no trees to penetrate into and destroy the cylinder material.

5—Rails are of solid rubber and do not encase either cathode lead or steel reinforcement. Consequently, there is no metal in the rail to expand, open up joints or crack the rail — and cause treeing.

The above points are emphasized because they are corrections of defects common to other plating barrels — defects which have resulted in higher barrel plating costs though excessively high maintenance cost.

MECHANICAL FEATURES

Heavy panels of special shock-resistant rubber made to Udylite specification. Rubber rails, steel reinforced, accurately slotted for perfect fit with panels.

Heavy rubber cylinder heads.

Steel end plates reinforce rubber heads of cylinder.

3/4 in. stay-bolts, bolted through rubber heads and steel plates, hold cylinder firmly together.

Cylinder does not rotate on dangler arbor, completely eliminating treeing at the usual slip joint construction.

Cylinder rotates on self-aligning bearings located at both ends.

Insulation of cathode lead is unbroken from bus bar to danglers — treeing completely prevented. Cathode lead is rod copper encased in three layers of rubber.

Anodically charged hanger houses cathode lead and protects it mechanically.

All metal parts, submerged in plating solution are anodically charged. Treeing is eliminated entirely.

Contact arbor shank heavily chromium plated to facilitate cleaning. Three danglers on arbor insure ample supply of current.

Thermo-controlled push button switch, conveniently located, guards motor against overloading or single phasing.

Welded steel tank of ample size to hold heating and cooling coils.

Large channel iron bridge member holds cylinder rigidly in alignment.

1/2 H. P. motor.

Speed latch insures positive contact. A flick of the finger operates it.

Steel pinion gears hardened and ground for longer life.

Door lock operates as unit. Snaps in and out of place with one movement.

Pins fastened to yoke connect cathode bus bar with cathode lead and support cylinder firmly in saddles at four points — two on each side of the tank.

Section 3, Article V

A. E. S. Constitution and By-Laws

It shall be the duty of the Secretary to keep an accurate report of the proceedings of each meeting, which are to be recorded in a book for that purpose. He shall send to the Supreme Secretary the names of all applicants for membership. **He shall send a corrected list of the membership of the Branch Society to the Supreme Secretary on the first day of December and May of each year. He shall send to the editor a report of each meeting and a copy of all papers presented within seven (7) days of the date of the meeting.** He shall keep an itemized account of all receipts and expenditures and perform all other duties as are required of a Secretary.

Business and Social News

BRANCH NEWS

Educational Activities

AMERICAN ELECTRO-PLATERS' SOCIETY

MILWAUKEE BRANCH

The regular meeting of Milwaukee Branch was held on Thursday evening, February 14, 1935 at 8 P. M. at Lipp's Hall. The meeting was called to order by President Pat. Sheehan. Minutes of the last regular meeting were approved as read. The Smoker Committee reported it had secured the Green Room at the Schroeder Hotel, for our Smoker and Educational Session, on Saturday evening, March 30, 1935. A well attended meeting, excellent turnout, again more new old faces, and the young men getting acquainted. After a short business session, Librarian Henry Binder and Asst. Librarian Al Hermansen took charge of the educational discussions.

Bright nickel discussion on polished and buffed brass. Excellent results; report some difficulty in operation; apparently solution must fit parts.

Bright Cadmium several types of parts were brought to the meeting, the pieces both barrel and still plated were as bright as well buffed cadmium plate. One of our local men has been instrumental in the development of solution and operating conditions necessary to get this excellent lustreful plate. We hope that in the future more will be known about the method and control. FRANK J. MARX

Milwaukee Branch cordially invites you to attend its 1935 Annual Smoker and Educational Session at the Hotel Schroeder Green Room, on Saturday, March 30th at eight P. M.

We have been particularly fortunate in obtaining some of the foremost Electroplating Engineers of the present time:

George B. Hogaboom — courtesy of Hanson-Van Winkle-Munning Co. — will tell us *"What is Under the Plate"*. A portrayal with slides.

W. H. Phillips, Research Engineer, General Motors Corp., Detroit, *Pictorial Study of Plating Conditions*, with slides, showing what is actually taking place in a plating solution.

H. A. Gilbertson, Supreme President A. E. S. — *Benefits of Membership in the A.E.S.* Also other interesting features.

DETROIT BRANCH

A regular meeting of the Detroit Branch was held on Friday evening, February 1st at 8:00 P. M. at the Hotel Statler. Col. J. H. Hansjosten presided, and a very good attendance was present. The minutes of the previous meeting were read and approved. There were no new applications for membership.

Mr. Eldridge, Chairman of the Educational Program Committee, reported that the meeting for February 21st to be held in the Woman's Club in conjuncton with the American Chemical Society, would be addressed by Dr. Fink of Columbia University, N. Y., and that all arrangements had been made for same.

It was also decided that we would hold our regular meeting on March 1st.

It was moved, seconded and carried that we receive applications for mem-

bership up to our April meeting without a $5.00 fee.

The speaker of the evening, Dr. Harry P. Coats of the Firestone Tire & Rubber Co., Akron, Ohio, was then introduced. Dr. Coats gave a wonderful talk on brass plating, illustrated with slides. It was decidedly educational and interesting.

While brass plating is not a new art, still it is quite unique in that this Company does not do brass plating for ornamentation or color. However the color is maintained. The plating it does on steel principally is to give the rubber, which is to be vulcanized on to these steel parts, the necessary adhesion, which otherwise it would not have without the proper coating of brass plating. The paper will be published in our REVIEW, and I know it will be read with very much interest. At the close of his address, there was a bombardment of questions, and he was very apt in his answers. In fact it seemed as though he just realized the questions that would be asked and had the answer immediately.

In our Question Box there were no questions for the evening, which I am sorry to say is not being very well patronized of late. However the evening was very well taken up and the meeting adjourned at 10:00 P. M.

T. C. EICHSTAEDT

WATERBURY BRANCH

Regular meeting of Waterbury Branch was held Friday evening, February 8th in Engineers Hall, President Tennant Elwin presided at the meeting, which was well attended by members of the Branch and friends. The attraction of the evening was "Bob" Leather of the Lea Mfg. Co., who delivered an interesting address on his recent travels through Europe. The speaker's remarks were accompanied by moving pictures taken at the time and were descriptive of the lands traveled by Mr. and Mrs. Leather. Interesting side-lights on labor and trade conditions as found by the speaker were touched on. Other views shown proved entertaining, the film displaying many A.E.S. celebrities from various parts of the country. All present expressed their pleasure and appreciation of the presentation and a rising vote of thanks was extended "Bob" for the evening's entertainment. Ellsworth Candee, chairman of the speakers committee announced that at the next meeting, our old friend and organizer of the Waterbury Branch, George B. Hogaboom would be the speaker. James H. Morsehead, a member of the local Branch and wife, were recently the recipients of many well wishes and congratulations, the occasion being the celebration of their golden wedding anniversary. W. F. GUILFOILE

ROCHESTER BRANCH

The Rochester Branch held its regular monthly meeting on Friday night, February 15 at Hotel Seneca with President Kohlmeier presiding. After routine business, a discussion was started on the proposed plan to increase our membership by the admittance of assistant foreman platers as associate members and it was finally decided to let the question lie over to the March meeting and the Secretary was ordered to notify each member that this question is to be discussed so as to determine Rochester's stand for the coming convention. After this the meeting was addressed with a few remarks by "Cyanide Bill" Schneider who was our guest for the evening. The following applications were received: Charles Henry Brunett, Spen-

cerport, N. Y., Active; Raymond L. DelRosso, 919 Chili Ave., Rochester, N. Y., Active. J. R. ELSTER

BRIDGEPORT BRANCH

The February meeting of the Bridgeport Branch was an open meeting in the Breakfast Room of the Stratfield Hotel.

The meeting was held on Friday, February 1 and called to order at 8.30 by the Chairman of the Program Committee, George Wagstaff. Immediately, Mr. George Hogaboom, the speaker of the evening was introduced. His subject was, "The External and Internal Conditions of Metal Before Plating." Mr. Hogaboom presented slides and explained them as he went along in his talk.

The Chairman of the Program Committee then turned the meeting over to Ray O'Connor, Chairman of the Convention Committee, who urged interested persons to sign up for membership.

Mr. Raymond Meyers then showed slides and talked of facts pertaining to the Plating Industry.

Meeting adjourned at 10.30.

W. H. FLAHERTY

CLEVELAND BRANCH

The regular monthly meeting of the Cleveland Branch was held at Hotel Carter, February 2, 1935. The meeting was called to order by our President, Mr. W. D. Scott at 8:15 P. M.

Our president told us of the death of Mr. Ben Hengst, one of our charter members, who resigned in September 1932. Motion was made and seconded that the Secretary be instructed to write a letter to Mrs. Hengst, expressing our sympathy and condolences, showing our appreciation for past favors granted by Mr. Ben Hengst. The minutes of the January meeting were approved as read.

A letter from the Baltimore Branch inviting us to their annual stag dinner was ordered filed. The Hotel bill was ordered paid. The Secretary not having sent in the minutes of the January meeting to our editor, the application of Mr. Hull could not be voted on as it must appear in the MONTHLY REVIEW.

Our librarian, Mr. Thompson, then read a paper on "Bright Nickel Plating." by Mr. Eckelman of The Pyrene Company, which was well discussed. The following papers were distributed on "A Method of Coating Plated Products," compiled by R. M. James.

After some talk on the coming convention the meeting adjourned.

WILLIAM E. O'BERG

TORONTO BRANCH

A goodly number of platers, plant supervisors and factory managers greeted George B. Hogaboom in the Mining Building, University of Toronto, Monday evening, January 28th, when he presented his splendid paper, "What Lies Under the Plate?" illustrated by some truly convincing lantern slides. George held the attention of his listeners and aroused much interest in the subject. John Acheson told the visitors why the A.E.S. was organized and how its members benefitted by the activities of the Society. Prof. J. T. Burt-Gerraus assisted by operating the lantern.

Routine business was dispensed with for the evening and our February meeting will be a lively one and possibly include an address by a man who is a recognized authority on the subject to be presented.

Watch for further definite announcements.

Members of Toronto Branch who

fail to regularly attend meetings are missing some rare treats.

Better be present at the next meeting fellows! We may hear more about what is "Under the Plate." If you have any good examples of troublesome surface conditions in raw stock, bring them with you.

H. W. GRAHAM

HARTFORD BRANCH

The Hartford Branch held its regular meeting on Monday evening, January 28, 1935, at the Bristol Elk's Club, Bristol, Conn. The meeting was called to order with President St. Pierre in the Chair. Minutes of the previous meeting were read and accepted. All communications were read and placed on file. No bills were presented at this meeting. It was voted, unanimously, to present a resolution to the Supreme Body, for the admittance of assistant foremen as associate members to the A.E.S.

We had as guest speaker for the evening, Mr. W. J. Schneider, of the E. I. du Pont de Nemours & Co., Inc., of Wilmington, Del., who gave a very interesting talk on "Brass Plating on High Zinc and Die Cast Metals." He had many samples of Die Cast Metal which had been brass plated then followed by nickel and chromium.

Some of the specimens had been plated for seven years, and still the appearance and adhesion of the brass was perfect. His talk, as well as the discussion which followed was thoroughly enjoyed, and in conclusion Mr. Schneider was given a rising vote of thanks.

The meeting, due to the severity of the weather, was attended by only fourteen members and was adjourned at 11:15 P. M.

V. E. GRANT

CHICAGO BRANCH

The regular monthly meeting of Chicago Branch was held February 9, at the Atlantic Hotel, President E. G. Stenberg presiding and all other officers present.

E. Rylander was transferred from Boston Branch to Chicago Branch and while we do not like to see other branches lose their members we are happy to welcome Mr. Rylander to Chicago Branch.

Two new applications were received, one from C. Kelly and one from J. E. Archer and committees appointed on same.

F. J. Hanlon, chairman of the Banquet Committee read the final report on our 23rd Annual Banquet after which the committee was discharged with a vote of thanks from the entire Branch.

O. E. Servis, J. Walsh, D. Greenblatt, H. A. Gilbertson and several more members spoke on the new proposed plan to admit Asst. Foreman Platers to the Society when endorsed by the foremen for whom they work. Their foreman must be a member of the Society in good standing. This matter was laid over for further discussion.

F. P. Romanoff of the Apollo Metal Works gave a very interesting talk on the use of the Tong Test for checking losses of current in each and every anode or rack in the plating bath. He then introduced J. W. Murphy who explained just how this instrument works. As this was something new to most of those present it proved to be of real educational value.

One of our popular members, Harold W. Faint has been transferred to New York City office by the firm for whom he works. All the Chicago boys wish Harold the best of luck in his new post.

O. E. Servis the librarian found the following questions in the question box:

1. *Want a nickel strip for cold rolled steel parts that are highly polished. Wish to strip the nickel off and not destroy the high polish lustre.*

Ans. Use the regular 54% Sulphuric strip with a little glycerine.

2. *How can excess sulfate in chrome solution be eliminated? If barium is recommended as best, does it hurt the solution if it remains on the bottom of the tank.*

Ans. No harm to the solution.

3. *How would you clean nickel plated parts before gold plating them?*

Ans. Many suggestions offered but no definite answer given to suit the needs of the party asking the question.

4. *If soap suds formed in the burnishing barrel from soap flakes is carried over to the cleaner where first class work is cleaned for nickel and chrome will suds be harmful to said work?*

Ans. Yes.

5. *The sample parts were plated in a normal cadylite solution, rinsed in cold water and hot water with one-half oz. whale oil soap per gal. What caused staining after one year in storage as shown on these articles?*

Ans. Many suggestions offered but was agreed that the stain was not due to anything but insufficient amount of cadmium.

6. *I would like to know of a brightener for nickel solution, parts plated are bent after and plate must not peel.*

Ans. Various brighteners are on the market or you can use cadmium stick till the nickel becomes bright then remove.

7. *What material and procedure would be the best for burnishing small die cast parts to brightness prior to plating?*

Ans. Any natural soap, and add about one drop of Glycerin, burnish from one half to one hour.

J. W. HANLON

ST. LOUIS BRANCH

Meeting of St. Louis Branch was called to order by Pres. Vogt. Roll call of Officers showed all present. Minutes of previous meeting were read and approved. Motion made and seconded that we hold a dinner meeting in March and invite anyone interested in Plating.

There was some discussion on having a banquet, but that was dropped, and it was suggested that we wait until Summer and have a Picnic. Nothing was decided at this meeting, but as we have a Chairman on Entertainment, this will give him food for thought, and he can be looking around.

Mr. H. J. Richards read one of his poems on Plating. Each member is to give some talk on the work he is doing so this gives you plenty of time to get something up. Now do not let this scare you away, as you will not be bored you will be limited to three minutes. Let's all set this date aside — March 8, 1935, at 6:15 P. M.

Meeting was turned over to Mr. Kells our Librarian, who asked for questions. Some were asked and answered. Some samples of Bright Nickle on Steel were shown. Any member that has samples should bring them along to our next Meeting.

No further business. Meeting adjourned.

CHAS. T. MCGINLEY

SPRINGFIELD BRANCH

The regular meeting of Springfield Branch was held at the T. J. Murray Co. office on Monday evening, February 25, 1935. Wm. Seidel the president was in charge of the meeting.

After routine-business was transacted a motion was made, seconded and

carried unanimously that the Springfield Branch favor the adoption of an amendment to the Constitution admitting assistant foremen as members of the Platers' Society. R. Leather, President of the Lea Mfg. Co., Waterbury, Conn. was the guest of the evening. Mr. Leather gave us a splendid entertainment for an hour, with camera views, showing pictures of his recent trip to England and the Continent. There were many familiar faces at the meeting including several young members who are about to join the Springfield Branch.

P. W. Prouty, M. & P. Engineer, Westinghouse E & M Co. will be the speaker at the March meeting. His subject will be "Lacquer and Enamel Developments in the finishing of Steel Sheets used in Refrigerator Cabinets." This promises to be a most interesting subject.

BALTIMORE-WASHINGTON BRANCH

We had the largest attendance at this year's dinner of any of the stag dinners that we have ever held; over ninety present. The entertainment was exceptionally good and the educational program which Mr. W. M. Phillips demonstrated was appreciated very much by all present. It was remarkable to see actually on the canvas screen in color just the action of the solution while in operation. Mr. Phillips pointed out what caused the defects in the plate and the pitting.

IRVIN H. HAHN

TORONTO BRANCH

Gales, sleet and low temperature were not a sufficient handicap for our members February 28th. They turned out in goodly numbers and full of pep. We discussed a little known method for

CROWN GEARED POLISHING LATHES

Made in Sizes 1/2 to 5 H. P.

Straight or Overhanging Types

Made by

CROWN RHEOSTAT & SUPPLY CO.

1910 MAYPOLE AVE. CHICAGO, ILL.

nickeling die castings and stopped because we knew very little about it. Can you imagine? Medal Bronze finish also engaged our attention and Charley Kemish is still doubtful.

Question—What is the best method for preparation of a steel base article which is to be used as a trophy?

Answer—Copper in cyanide bath, buff to high lustre and silver plate.

Question—Is it practical to deposit copper over buffed nickel surfaces for commercial renickeling of products?

Answer—Not practical for commercial production. Can be done but is not advised. Destroy lustre by use of some abrasive or a bright dip.

Question—Can zinc base die castings be heavily nickel plated satisfactorily?

Answer—Yes.

Mr. Acheson referred to the membership drive and the advisability of making an extra effort to obtain new members. He suggested the appointment of a Membership Secretary and as a result W. S. Barrows, 628 Dovercourt Road, Toronto was chosen for the work. Mr. Barrows will be glad to receive names and addresses of prospects within the jurisdiction of Toronto Branch, then he will throw out the life line. Come on fellows, send in name and address of any plater you can recommend for membership. Our annual Euchre Party will be held in March and at Hunt's as usual. Members are requested to donate prizes. We still have a few unemployed members, but business generally is improving.

H. W. GRAHAM

GUARANTEED — 100%! Try McKeon's "Liquid Sulphur" NOW (if you don't already use it for YOUR oxidizing). A trial order will convince you it is truly "The Oxidizing Agent of Today". SAMPLE Free . . . ASK for it!" Sulphur Products Co., Inc., Greensburg, Pa.

BUFFING AND POLISHING COMPOUNDS

Specializing in the manufacture of clean-working buffing and polishing compounds the Lea Mfg. Co. have on the market three distinct successes in this line.

LEAROK is designed primarily for buffing or coloring articles which because of their shape or the nature of their surfaces involve cleaning difficulties. It does not pack up in the recesses or ornamentations as do the ordinary types of compounds.

It contains abrasives plus lubrication and produces bright finishes quickly and economically. It eliminates the need for excessive hand-scrubbing, long-soaking or inflammable solutions.

LEA COMPOUND contains sharp, fast-cutting abrasives. It will not pro-

RHEOSTATS *by* UDYLITE

● Udylite Rheostats are the best current-control instruments made. Of highest quality materials and workmanship, they last longer and provide more accurate current regulation. Write for illustrated folder and price list.

THE UDYLITE COMPANY
1651 East Grand Blvd., Detroit, Michigan
NEW YORK 30 E 42nd St. CHICAGO 205 Wacker Drive CLEVELAND 708 Keith Bldg.
SAN FRANCISCO, 114 Sansome St

duce a bright finish because it lacks lubricating properties.

Several grades are available, each best for certain classes of work. Some grades are used to eliminate polishing wheels in the finer numbers. They produce a dry, abrasive coated wheel with a flexible surface which is used where polishing wheels have not sufficient flexibility to get into contours, recesses, or ornamentations. Other grades are used for the production of Brush or Satin finishes. These eliminate the final washing and drying operations.

LEA NICKEL GLO. This is an addition agent for nickel plating solutions. It produces bright plated surfaces. The work comes from the tank with a finer deposit of metal, thus producing a higher lustre. On small articles, the use of LEA NICKEL GLO makes it possible to eliminate entirely color buffing. It produces a fine bright surface upon which to deposit Chromium plate.

With LEA NICKEL GLO there is nothing to form a sludge in the bottom of the tank. There is nothing that will interfere with current transfer.

It is economical, from two to five ounces per 100 gallons being all that is needed to turn out excellent work.

Write for your copy of the Lea Reference Book — it is free. Address a postal card to Lea Mfg. Co., Waterbury, Conn.

BOOK REVIEW

Electrochemical Methods for Protecting Metals against Corrosion. (Procédés Electrochemiques de Protection des Metaux Contra La Corrosion.) P. Jacquet, 42 pp. Hermann et Cie, Paris, 1934.

This pamphlet is No. 163 of the series entitled "Actualités Scientifiques et Industrielles", of which the electrochemical numbers have been prepared under the direction of Ch. Marie.

This book is a concise presentation of the principles of corrosion, and of protection against corrosion by metallic coatings and oxide films. The author summarizes the results of his own studies upon the protective value of nickel, chromium, zinc, and cadmium coatings, and compares them with the results of other investigations. In general, the results of Jacquet are consistent with those recently published by the National Bureau of Standards.

W. Blum

THE ACCEPTED STANDARD

TESTING INSTRUMENTS

FOR PLATING SOLUTIONS

Write for leaflets

KOCOUR CO.

4725 S. TURNER AVE. CHICAGO, ILL.